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MEMOIRS

OF THE

GEOLOGICAL SURVEY

OF

THE UNITED KINGDOM.

Figures and Descriptions

ILLUSTRATIVE OF

BRITISH ORGANIC REMAINS.

DECADE I.-VI

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N O T I C E.

PALÆONTOLOGICAL researches forming so essential a part of geological investigations, such as those now in progress by the Geological Survey of the United Kingdom, the accompanying plates and descriptions of British Fossils have been prepared as part of the Geological Memoirs. They constitute a needful portion of the publications of the Geological Survey, and are taken from specimens in the public collections, or lent to the Survey by those anxious to advance this branch of the public service. Although numerous drawings had previously been made, and engravings from them considerably advanced, it was not thought expedient to commence their publication until the large collections of the Survey could be well examined, which a want of the needful space has, until the present time, considerably retarded. This impediment to progress is now being removed, and when the collections can be properly displayed in the New Museum of Practical Geology, in Jermyn Street, it is hoped that the public will have an opportunity of gradually obtaining, in a convenient manner and at small cost, a work illustrating some of the more important forms of animal and vegetable life there preserved, and which have been entombed during the lapse of geological time in the area occupied by the British islands.

The plan proposed to be followed in the work, of which the two Decades now published form a part, is as follows:—

To figure in elaborate detail, as completely as possible, a selection of fossils, illustrative of the genera and more remarkable species of all

classes of animals and plants the remains of which are contained in British rocks ; to select especially such as require an amount of illustration which, to be carried out by private enterprise, would require a large outlay of money, with little prospect of a return, and a long time to accomplish, but which, by means of the staff and appliances necessarily employed on the Geological Survey, can be effected at small cost, and with a rapidity demanded by the publication of the maps and memoirs of the Survey ; thus, it is hoped, affording an aid to those engaged in the sciences with which this work is connected, that they might not otherwise have possessed, and which may materially promote the progress of individual research.

H. T. DE LA BECHE,
Director-General.

Geological Survey Office,
24th May, 1849.

BRITISH FOSSILS.

DECADE THE FIRST.

THE first Decade of representations of British Fossils is devoted to a selection of Echinoderms, of the Orders *Asteriadae* and *Echinidae*.

With the exception of the *Crinoidea* and *Cystidea*, no special monographs have been devoted to the illustration of our fossil species of Echinodermata, notwithstanding their acknowledged importance in a geological point of view. The majority of species found in British strata are unfigured in British works; a very great number are not figured at all, and those of which we possess British figures are, for the most part, delineated either imperfectly or insufficiently for the demands of science in its present state. This is the more remarkable since, for the description and delineation of numerous species, ample materials exist in collections.

Of the following plates, one is devoted to figures of all the Silurian star-fishes as yet discovered in British strata. None of these have hitherto been represented in any work. Their names only, accompanied by short descriptive characters, have appeared in the "Synopsis of British Fossil Asteriadae," contained in the second part of the second volume of the "Memoirs of the Geological Survey of Great Britain." Some remarkable new forms of star-fishes from the Oolites, and all as yet discovered in the London clay, are figured in the second and third plates.

The fourth plate is devoted to a representation of the only fossil as yet discovered of the family *Euryales*, now for the first time described and figured, through the kind co-operation of the Rev. Professor Sedgwick.

In the six following plates a series of illustrations of the British fossil *Echinidæ* is commenced, of the majority of which, even the commonest and those most important for the identification of strata, no good representations are accessible to the student of English fossils. The importance of a knowledge of the members of this family to the explorers of oolitic and cretaceous strata cannot be too strongly insisted on, and their beauty and interest, in a purely Natural History point of view, render them admirable subjects for elaborate delineations.

When the collections accumulated during the course of the progress of the Geological Survey have been thoroughly examined and arranged, new light may be expected, bearing on the details of structure of the species now figured. Additions will consequently be made to the plates from time to time; and it is proposed to issue supplementary figures of the variations of form exhibited by the several species selected as subjects for these decades.

EDWARD FORBES.

May, 1849.

BRITISH FOSSILS.

DECADE I. PLATE III.

TERTIARY (EOCENE) SPECIES OF GONIASTER.

[Genus GONIASTER. AGASSIZ. (Sub-kingdom Radiata. Class Echinodermata. Order Asteroidea. Family Goniasteriæ). Body pentagonal; a vent on the dorsal surface; disk much depressed, flat when dead; skeleton composed of tessellated plates, variously studded with granules, spines, and in many instances, pedicellariæ; rarely naked; margins bounded by two series of large plates; suckers biserial.]

FIG. 1.

GONIASTER STOKESII.

E. FORBES, in "Memoirs of the Geological Survey of Great Britain," vol. ii. part 2, p. 475.

DIAGNOSIS. *G. corpore pentagonali, angulis longè productis, lateribus profunde lunatis: ossiculis lateralibus superioribus disci oblongo-quadratis depressis eu convexiusculis, brachialibus quadratis tumidis, extrorsum abruptis; omnibus punctatis, inferioribus similaribus.*

Description.—Although I have never met with this very distinct species in a perfect condition, numerous fragments of greater or less dimensions give a very perfect notion of its size, form, and proportions. The body was pentangular, with angles greatly produced, and even attenuated at their extremities (fig. 1, *a.* and *d.*) into linear parallel-sided arms. The disk was flat, and, as well as the arms, bordered by a double series of subquadrate, steep-sided, somewhat nodular, nearly equal, thick marginal plates, the sides of which are quite equal in dimensions to the summits (fig. 1, *b.* and *c.*). These plates are coarsely but rather regularly punctated on their exposed surfaces. Their prominent nodular summits seem often as if subtruncated. The nodular convexity of each plate is placed towards its marginal extremity. The summits of the superior plates are more prominent than those of the inferior. Towards the prolonged extremities of the arms these nodulations begin to disappear; but the plates are always highly convex in their centres, so as to be strikingly distinct from each other, and to seem as if separated by a deep sulcus. The extremities of the rays are slightly swollen. They terminate in a distinct small semicircular ocular plate, bordered on each side by two (transformed marginals) small oblong oculars. The surface

of the disk dorsally is covered with small irregular and pentagonal punctated flat plates, those towards the centre of the rays arranged in a more or less distinct series. Similar ossicula occupy the interambulacral spaces beneath. The ambulacra are bordered by quadrate stout plates of moderate dimensions, furrowed on their surfaces by three or four strongly marked longitudinal grooves, which are the lodging-places of small ambulacral spines.

This species must have attained considerable dimensions. The largest fragment figured (1, *b.*) would indicate a star-fish measuring at least 8 inches from the extremity of one arm to the end of that most distant, of which $2\frac{1}{4}$ inches would go to the disk. The marginal plates in this specimen measure 3-16ths of an inch across, and nearly as much high. The number of marginal plates in a full-grown specimen was probably about 28 on either side of each produced angle.

Locality and Geological Position.—*Goniaster Stokesii* occurs not unfrequently in the London clay of Sheppey. The specimens figured were communicated to the Geological Survey by Mr. Charles Stokes, and Mr. Bowerbank possesses a number of fragments of the same species. The peculiar convex, nodulose marginal plates, conspicuously distinguish it from any other tertiary star-fish.

FIG. 2.

GONIASTER MARGINATUS.

E. FORBES, in "Memoirs of the Geological Survey of Great Britain," vol. ii. part 2, p. 475.

DIAGNOSIS. *G. corpore?*—*ossiculis lateralibus disci magnis, oblongis, convexiusculis, rugoso-punctatis, marginatis; margine elevato.*

Description.—All that we possess of this species is a fragment, consisting of five superior and as many inferior marginal plates, which, however, present characters so distinct that they cannot belong to any other described tertiary star-fish. The superior plates are large, oblong, regularly declining outwardly, and low-sided. Their surface is but slightly convex, thickly punctured all over, and bordered laterally by a distinct elevated rim. The inferior plates are similar, but have even more elevated margins, and the rim is continued on them across their outer sides. What few body plates are visible are small and punctate. The fragment measures one inch and one-eighth in length. The largest plate is three-eighths of an inch in length, and less than two-eighths at its broadest part.

Locality and Geological Position.—The specimen is from the London clay of Sheppey, and was communicated to the Geological Survey by Mr. C. Stokes.

TERTIARY (EOCENE) SPECIES OF ASTROPECTEN.

[Genus ASTROPECTEN. LINCK. (Sub-kingdom Radiata. Class Echinodermata. Order Asteroidea. Family Asteriidae). Body stellate, few (five) rayed; no vent; rays flat on both sides, regular; surface of body, and upper sides of arms covered with paxillae. Ambulacra with two rows of suckers, bordered by spines. Margins of the arms bordered by a double row of conspicuous plates.—The genera STELLARIA of NARDO and ASTERIAS (restricted) of AGASSIZ are synonymous.]

FIG. 3.

ASTROPECTEN CRISPATUS.

E. FORBES, in "Memoirs of the Geological Survey of Great Britain," vol. ii. part 2, p. 479—(icon.) Ansted, "Geology," vol. ii. p. 66, woodcut.

DIAGNOSIS. *A. radiis late lanceolatis, attenuatis, angulis intermediis valde obtusis; ossiculis marginalibus anguste oblongis, numerosis, spiniferis; disco lato.*

Description.—Disk broad, rays lanceolate, broad at their bases, attenuated at their extremities, and forming very obtuse angles at their junctions with each other; the lanceolate portion of the arms is about one-fifth longer than the disk is broad. They are bordered by closely set oblong, narrow plates, very numerous, about 36 on either side of each ray in the largest specimen examined. These marginal plates decline outwardly. Those bordering the angles of junction preserve their dimensions. All the marginal plates bear at their exterior and superior edges short obtuse lanceolate spines. The inferior marginal plates are curved more regularly than the superior. The ossicula of the surface and framework of the disk are very irregular. The section of an arm shows that it was of inconsiderable thickness, and, from the peculiar shape of the marginal plates, edged at the sides. The ossicles bordering the ambulacra are of considerable dimensions. The extremities of the arms seem (judging from the fragment fig. 1, c.), to be much attenuated; but the plates bordering them preserved the proportions of those nearer the body. The breadth of the disk in the largest specimen I have seen is one inch four-twelfths. The rays are nine-twelfths of an inch broad at their bases. The marginal ossicles are four-twelfths of an inch broad, by less than one-twelfth long. The thickness of a ray is less than two-twelfths.

Locality and Geological Position.—In the London clay of Sheppey, where specimens are not uncommon. Those represented at figs. 3 b and 3 c, were communicated to the Geological Survey by Mr. Stokes. Fig. 3 a is a remarkably fine specimen, in the collection of Mr. Bowerbank.

FIG. 4.

ASTROPECTEN ARMATUS.

E. FORBES, in "Memoirs of the Geological Survey of Great Britain," vol. ii. part 2, p. 479.

DIAGNOSIS. *A. radiis lanceolatis, angulis intermediis valde obtusis, ossiculis marginalibus oblongis carinatis, extrorsum longé spinosis.*

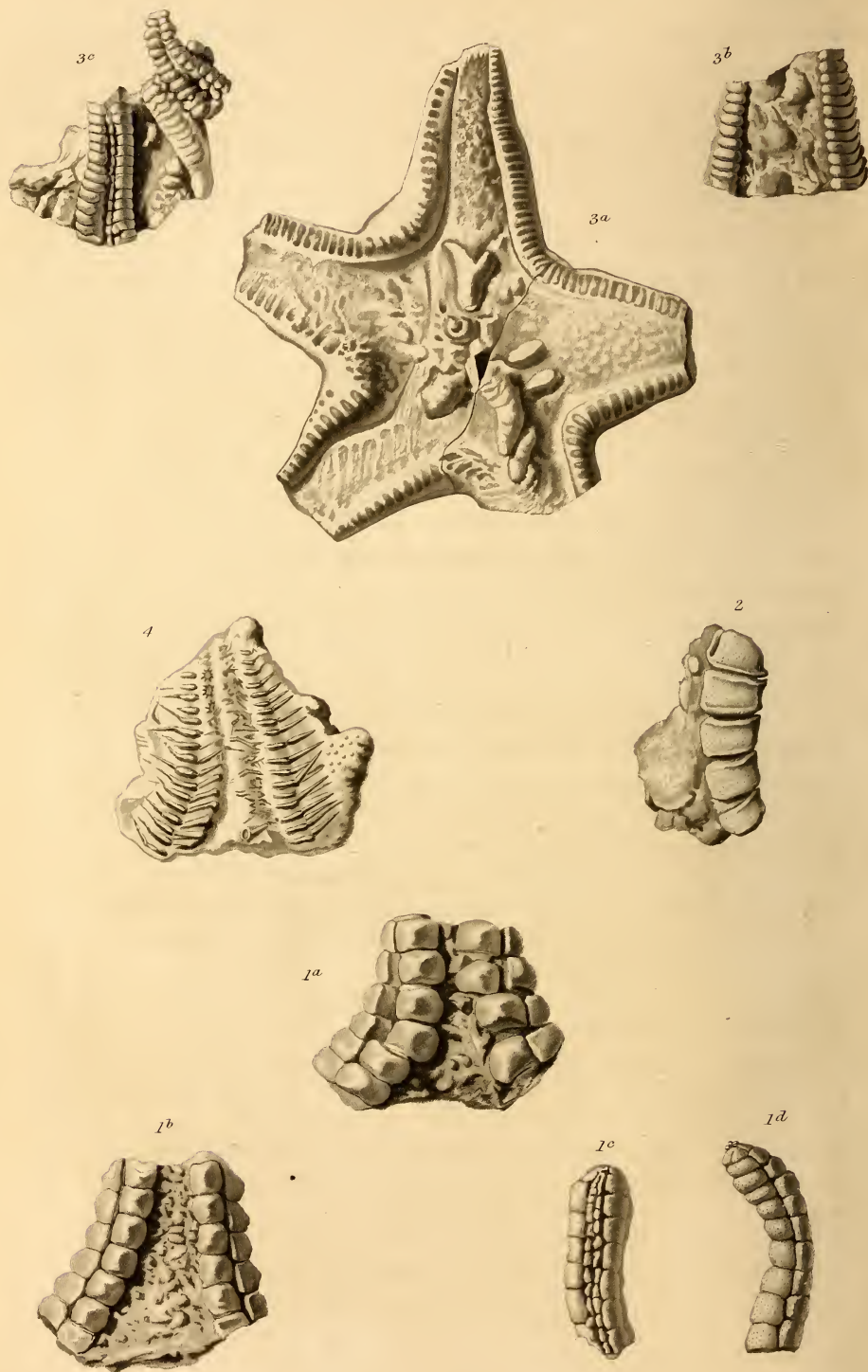
Description.—The only fragment of this very distinct species is the greater portion of a single arm. It exhibits a lanceolate, depressed ray, with well-marked oblong carinated marginal ossicula, bearing towards their outer sides stout linear spines, equal in length to their breadth. The spines are set directly in connexion with the ridges. About 19 plates, and as many spines in a row, are preserved. The fragment measures nine-twelfths of an inch in breadth at its base, and one inch three-twelfths in length; the spines and plates are respectively about three-twelfths of an inch in length.

Locality and Geological Position.—This unique and curious specimen, contained in the collection of Mr. Bowerbank, is from the London clay of Sheppey.

E. FORBES.

April, 1849.

Geological Survey of the United Kingdom.

GONIASTER
ASTROPECTEN
(Tertiary)1 GONIASTER STOKESII *Forbes*2 MARGINATUS *Forbes*3 ASTROPECTEN CRISPATUS *Forbes*.4 ARMATUS *Forbes*.